भारतीय मानक
Indian Standard

IS 13630 (Part 12) : 2019

सिरैमिक टाइलें — परिक्षण पद्धतियां नमूने लेने एवं स्वीकार्यता का आधार

भाग 12 काँचाभ रहित टाइलों के गहरे अपघर्षण की प्रतिरोधिता ज्ञात करना

(दूसरा पुनरीक्षण)

Ceramic Tiles — Methods of Test, Sampling and Basis for Acceptance

Part 12 Determination of Resistance to Deep Abrasion of Unglazed Tiles

(Second Revision)

ICS 91.100.23

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May 2019 **Price Group 3**

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

FOREWORD

This Indian Standard (Part 12) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Flooring, Wall Finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard (Part 12) was first published in 1993 and subsequently revised in 2006. This second revision incorporates the experience gained with the use of this standard and brings the standard in line with the latest developments in this field.

The following are the significant modifications incorporated in this revision:

a) Calibrating procedure for abrasion apparatus has been changed.

This Indian Standard is published in several parts. The other parts in this series are:

Part 1	Determination of dimensions and surface quality
Part 2	Determination of water absorption and bulk density
Part 3	Determination of moisture expansion using boiling water
Part 4	Determination of linear thermal expansion
Part 5	Determination of resistance to thermal shock
Part 6	Determination of modulus of rupture and breaking strength
Part 7	Determination of stain and chemical resistance of unglazed tiles
Part 8	Determination of stain and chemical resistance of glazed tiles
Part 9	Determination of crazing resistance of glazed tiles
Part 10	Determination of frost resistance
Part 11	Determination of resistance to surface abrasion of glazed tiles
Part 13	Determination of scratch hardness of surface according to Mohs' scale
Part 14	Determination of impact resistance by measurement of coefficient of restitution
Part 15	Sampling and basis for acceptance
Part 16	Determinations of lead and cadmium given off by glazed tiles

In the formulation of this standard considerable assistance has been derived from the ISO 10545-6 : 2010 'Ceramic tiles — Part 6: Determination of resistance to deep abrasion for unglazed tiles'.

The Committee responsible for the formulation of this standard is given in Annex A.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

Indian Standard

CERAMIC TILES — METHODS OF TEST, SAMPLING AND BASIS FOR ACCEPTANCE

PART 12 DETERMIATION OF RESISTANCE TO DEEP ABRASION OF UNGLAZED TILES

(Second Revision)

1 SCOPE

This standard (Part 12) covers a method of test for determining the resistance to deep abrasion of all unglazed ceramic tiles used for floor coverings.

2 REFERENCES

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
2062 : 1999	Steel for general purposes (*fifth revision*)
11643 : 1985	Specification for silicon carbide for bonded abrasive products.

3 PRINCIPLE

Determination of the abrasion resistance of unglazed ceramic tiles by measuring the length of the groove produced in the proper surface by means of a rotating disc under given conditions and with the use of abrasive material.

4 ABRASIVE MATERIAL

White fused aluminum oxide conforming to the grain size requirement of Grit No. 80 of Table 1 of IS 11643.

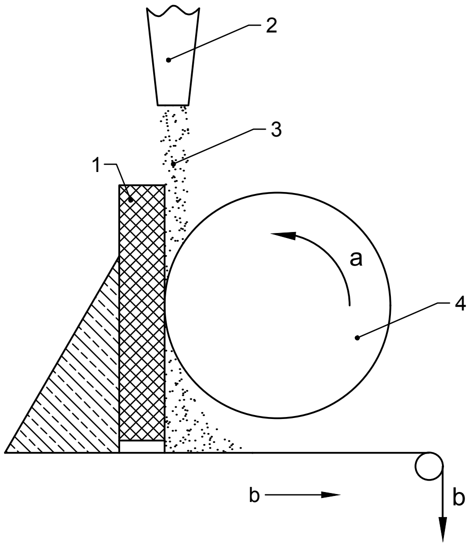
5 APPARATUS

5.1 Abrasion Apparatus — It consists essentially of a rotating disc, a storage hopper with dispensing device for the abrasive material; a test specimen support and a counterweight (*see* Fig.1).

5.1.1 The disc is made of Fe 410-S steel as specified in IS 2062, with a diameter of 200 ± 0.2 mm, and thickness at the edge of 10 ± 0.1 mm, and with a rate of revolution of 75 rev/min. The pressure with which test specimens are held against the steel disc is determined by calibrating the apparatus against transparent fused silica. The pressure is adjusted such that, after 150 revolutions using Grit 80 fused aluminum oxide a chord of 24 mm is produced.

5.1.2 When the diameter has worn to 199 mm, the steel disc shall be replaced.

5.2 Measuring Gauge, capable of measuring to 0.1 mm.



KEY
1. TILE
2. DISPENDING DEVICE FOR THE ABRASIVE MATERIAL
3. WHITE FUSED ALUMINIUM OXIDE OF GRAIN SIZE F80
4. ROTATING STEEL DISC
a DIRECTION OF ROTATION
b COLLECTION OF MATERIAL WHICH HAS BEEN REMOVED

FIG. 1 SCHEMATIC DIAGRAM OF DEEP ABRASION EQUIPMENT

6 TEST SPECIMENS

6.1 Types of Test Specimens

Test shall be carried out using whole tiles or test specimens of suitable dimensions. Before testing, small specimens shall be fixed with an adhesive on to a larger background, avoiding joints.

6.2 Preparation

Clean, dry test specimens shall be used.

6.3 Number of Test Specimens

A minimum of five test specimens shall be tested.

7 PROCEDURE

7.1 Place a test specimen in the apparatus so that it is tangential against the rotating disc. Ensure that the feed of abrasive material into the grinding zone is uniform at a rate of at least 100 g/100 revolutions.

7.2 Rotate the steel disc for 150 revolutions. Remove the test specimen from the apparatus and measure the chord length of the groove by means of the measuring gauge to the nearest 0.5 mm. Test each specimen in at least two places at right angles on its proper surface.

7.3 If relief surfaces would interfere with the determination of the abrasion resistance, the projections may be ground off but the results of the test will not be the same as for tiles having plane surfaces.

8 EXPRESSION OF RESULTS

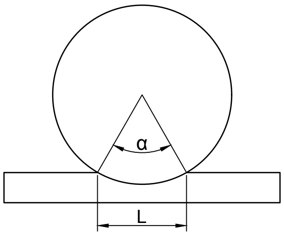
8.1 The resistance of deep abrasion is expressed as the volume *V* of material removed, in cubic millimeters. This is calculated from the chord length *l* of the groove by means of the expression:

$$V = [(\pi.\alpha/180)-\sin\alpha]\,h.d2/8$$

where

$$\sin(\alpha/2) = \frac{l}{d}$$

d = diameter of the rotating disc, in mm;
h = thickness of the rotating disc, in mm;
α = angle (in degrees) subtended at the center of the rotating disc by the chord (*see* Fig. 2); and
l = length of the chord, in mm.



KEY
α ANGLE, IN DEGREES, SUBTENDED AT THE CENTRE OF THE ROTATING DISC BY THE CHORD
L CHORD LENGTH IN MILLIMETRES

FIG.2 DEFINITION OF CHORD

8.2 Some equivalent values are given in Table 1.

Table 1 Equivalent Value

(*Clause* 8.2)

l mm	*v* mm³	*l* mm	*v* mm³	*l* mm	*v* mm³	*l* mm	*v* mm³	*l* mm	*v* mm³
20.0	67.0	30.0	227	40.0	540	50.0	1 062	60.0	1 851
20.5	72.0	30.5	238	40.5	561	50.5	1 094	60.5	1 899
21.0	77.0	31.0	250	41.0	582	51.0	1 128	61.0	1 947
21.5	83.0	31.5	262	41.5	603	51.5	1 162	61.5	1 996
22.0	89.0	32.0	275	42.0	626	52.0	1 196	62.0	2 046
22.5	95.0	32.5	288	42.5	649	52.5	1 232	62.5	2 097
23.0	102.0	33.0	302	43.0	672	53.0	1 268	63.0	2 149
23.5	109.0	33.5	316	43.5	696	53.5	1 305	63.5	2 202
24.0	116.0	34.0	330	44.0	720	54.0	1 342	64.0	2 256
24.5	123.0	34.5	345	44.5	746	54.5	1 380	64.5	2 310
25.0	131.0	35.0	361	45.0	741	55.0	1 419	65.0	2 365
25.5	139.0	35.5	376	45.5	798	55.5	1 459	65.5	2 432
26.0	147.0	36.0	393	46.0	824	56.0	1 499	66.0	2 479
26.5	156.0	36.5	409	46.5	852	56.5	1 541	66.5	2 537
27.0	165.0	37.0	427	47.0	880	57.0	1 583	67.0	2 595
27.5	174.0	37.5	444	47.5	909	57.5	1 625	67.5	2 636
28.0	184.0	38.0	462	48.0	938	58.0	1 669	68.0	2 717
28.5	194.0	38.5	481	48.5	968	58.5	1 713	68.5	2 779
29.0	205.0	39.0	500	49.0	999	59.0	1 758	69.0	2 842
29.5	215.0	39.5	520	49.5	1 030	59.5	1 804	69.5	2 906

9 TEST REPORT

The test report shall contain the following:

a) Description of the tiles;
b) Chord length l of each groove to the nearest 0.5 mm;
c) Volume V, in cubic millimetre, for each individual groove; and
d) Average volume V_m, in mm^3.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

Organization	*Representative(s)*
In Personal Capacity (*L/109, Sarita Vihar, New Delhi*)	Shri Ashok Khurana (***Chairman***)
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Organization	*Representative(s)*
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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